

Heads Up: Real News About Drugs and Your Body

Brought to you by Scholastic and the scientists at the National Institute on Drug Abuse, National Institutes of Health, U.S. Department of Health and Human Services

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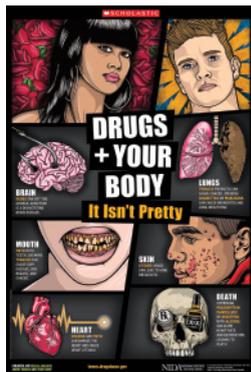
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Also available:
Drugs + Your Body: It Isn't Pretty

Web Interactive

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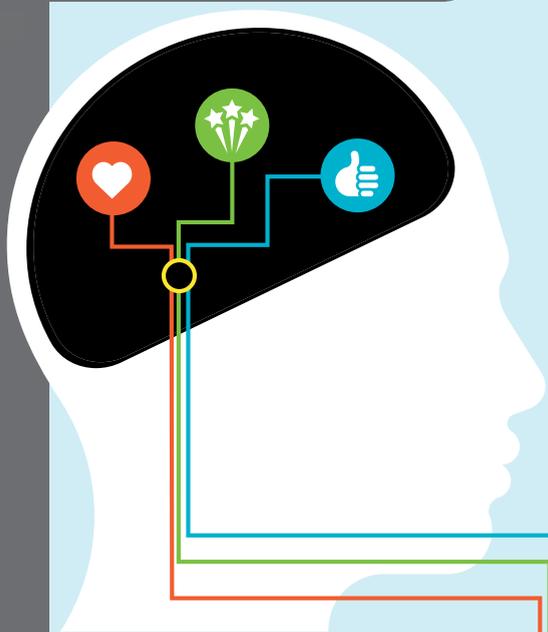


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- For this Heads Up **Student Edition Compilation** refer to **NIH Pub No. 14-7655**.
- For the accompanying Heads Up **Teacher Edition Compilation** refer to **NIH Pub No. 14-7656**.



The Awesomely



Have you ever thought about how many different things your brain can do? This amazing organ, which scientists are only beginning to understand, has been refined through millions of years of evolution. It helps you process information—often before you are aware of it. And it figures out things fast, even when information is incomplete. Did you know that your brain even controls what you *enjoy*? The brain does this to help you survive and to keep your body's internal environment stable and balanced, a state known as *homeostasis*. The brain is awesomely complex and crucial to who we are and how we live.

THE BRAIN'S REWARD SYSTEM

Your brain has evolved to make you feel good when you do things that help you survive. The pleasure you feel is caused by the chemical *dopamine*, which is released in your brain's reward system. When you enjoy certain activities, dopamine is released, and you are more likely to repeat those activities. This brain system has evolved to help you learn and grow, and to become healthy, happy, and successful.



THAT LOOKS GOOD...The brain has evolved to crave the fattiest meats, the sweetest fruits—natural, unprocessed foods that contain the highest energy. Why? Because our evolutionary survival instinct tells us that famine may be just around the corner.



WHAT A RUSH! You live to skateboard. Your friends love it when you complete 360° turns. No doubt you are taking some risk, but it's healthy! Evolution has designed us to learn from new experiences so that we become independent—and find our own place in this world.



CRUSH ALERT When you first met, you couldn't stop flirting with each other. Why? Members of every species are designed to find a partner, and humans are no different.



BRAIN EVOLUTION TIMELINE

THE EARLY BRAIN Focus on Survival—MILLIONS OF YEARS



MILESTONES



WALKING UPRIGHT

6,000,000 Years Ago



FIRST TOOLS

2,600,000 Years Ago

Evolved Human Brain

WHEN TOO MUCH OF A GOOD THING CAN BE BAD

The brain's reward system can go haywire. This is especially true in today's world, where many of the foods we eat are highly processed, and technology invades almost every aspect of our lives, overloading us with information. Because evolution takes millions of years, our brains have not yet caught up with the demands of today. This overload can throw us out of balance and lead to *compulsivity*—or the inability to stop a behavior, even when it's harmful.



"I JUST ATE AN ENTIRE FAMILY-SIZE BAG OF CHIPS."



TRYING DRUGS IN ORDER TO FEEL A RUSH

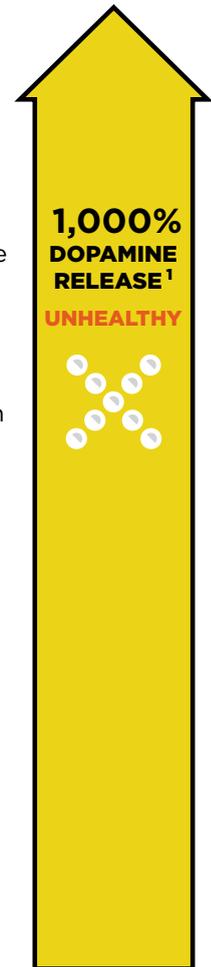


CHECKING YOUR PHONE FOR TEXTS 100 TIMES AN HOUR

Dopamine Overload

Ever feel like you just can't stop? Maybe it's eating potato chips, or maybe it's playing a video game over and over—it can be different things for different people. These experiences overstimulate the brain's natural reward system, causing some people to compulsively repeat certain behaviors, like overeating, which can cause obesity.

It also happens with drugs, which overload the brain with dopamine. This is why for some people, experimentation can lead to addiction.



150% DOPAMINE RELEASE¹



HEALTHY EATING

DRUGS

RAPID BRAIN GROWTH

Rise in Innovation—THOUSANDS OF YEARS

CONTROLLING FIRE
800,000 Years Ago

CREATION OF SYMBOLS²
40,000 Years Ago

CREATION OF ALPHABET³
3,000 Years Ago

THE BRAIN IN THE MODERN AGE

Dramatic Technological Advances—HUNDREDS OF YEARS

INVENTIONS
 SCIENCE/MEDICINE

PROCESSED FOODS
 TECHNOLOGY

COMMUNICATION
 MASS PRODUCTION

500 Years Ago to TODAY

¹ Compared to the baseline dopamine level of 100%, the amount of dopamine present in the absence of a reward stimulus. ² Some estimates push this as far back as 164,000 years ago. ³ Icon includes two letterforms from the ancient Phoenician alphabet.

“Wiring” Your Brain

Your actions as a teen directly influence your brain’s efficiency.

Our brains develop from birth through adulthood in a process that starts with our genes but is then shaped by our experiences. So although you don’t have control over the building blocks (genes) of who you are, you do have a say in who you will *become*. In fact, it is during your teen years—yes, right now!—that you have the most say in how efficiently your brain applies new information. In other words, the habits and skills you practice now will take less time and effort in the future.

HOW? Brain cells, called *neurons*, communicate with each other through connections called *synapses*. During childhood, your brain produces more of these synaptic connections than you actually need. This abundance allows you to develop skills as you grow, such as coordinated movements for sports and academic skills for school.

As a person ages, synapses that are used a lot become strong and efficient, while unused synapses die off in a process known as *synaptic pruning*. So the more you do a certain activity—for example, solving a math problem or throwing a ball—the better you become at it.

USE IT

OR

Think of what is involved in learning to play an instrument. As you practice regularly and study compositions, your brain activates numerous synaptic connections between neurons that control creativity, finger movements, and understanding of music. This reinforces both the strength of these neurons and the efficiency of the connections. So it’s easier for an experienced musician to learn a complicated piece of music than it is for a beginner.



WHERE'D YOU GET THOSE FANCY SYNAPSES?

The brain is composed of a network of *neurons* (brain cells) connected by *synapses* (“living circuits” through which information flows). The complexity of this network is what allows humans to create art, feel emotion, solve problems, and be unique individuals, among many other things.



NEWBORN

A newborn’s brain starts out with at least 100 billion neurons. The brain is focused on basic body functions, such as heart rate, breathing, eating, and sleeping.



0 to 3 YEARS

At its peak, the brain of a toddler may create as many as 2 million synapses a second. The brain is focused on fundamental skills like talking, playing with others, and following directions.



LOSE IT

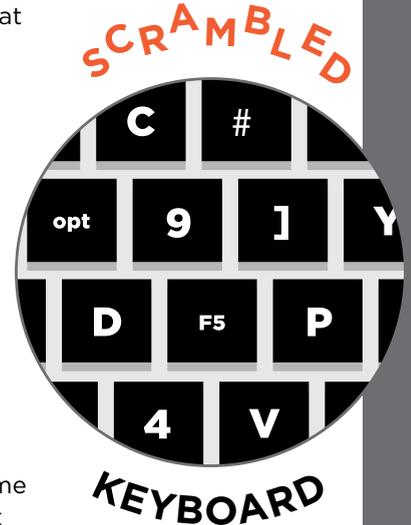
Practicing certain skills strengthens the related synaptic connections. At the same time, the brain will get rid of connections that are not used. This ability of the brain to modify its circuitry is strongest in the teen years. This means that it is easier for you—as a teen—to learn something new and remember it, such as a foreign language, than it is for an adult. It also means that teens can shape who they will become as adults through their experiences and actions.



DRUGS AND BRAIN DEVELOPMENT

As a teen, you have a lot of say about how your brain develops. But using drugs can undo all of your hard work. Think of your brain like a computer and yourself as a programmer.

Imagine you sit at the keyboard to write code for a program. But what if the keys were scrambled? If you typed your name using the keyboard to the right, with your fingers positioned for standard touch typing, your name would come out unrecognizable. If you were typing code, your program wouldn't work correctly.



Similarly, drug abuse during your teen years scrambles how information flows between your synapses. Using drugs can negatively affect your attention, memory, and problem solving—not just as a teen, but well into your future. Drug use during your teen years can even “wire” your brain for addiction—a devastating disease that affects millions of lives.

3 YEARS

By age 3, brains have approximately a quadrillion* synapses, many more than needed. Some synapses are strengthened, but many are gradually discarded (synaptic pruning).



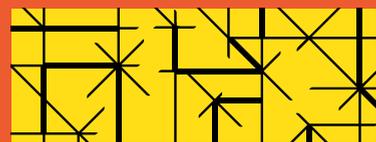
TEEN YEARS

Though the brain reaches its full physical size by age 12, the process of synaptic pruning continues in response to new experiences throughout the teen years.



20s to 30s

Synaptic pruning is in the final stages. The brain has become more efficient based on experience, requiring less effort to accomplish familiar activities.



* 1,000,000,000,000,000

More Info: For additional facts about the brain and drugs, visit scholastic.com/headsup and teens.drugabuse.gov.



Pushing Pause

Science shows that by pausing, you can help shape your destiny through self-control



“OMG! Did I really just send that text?”

Most people have said something that they wish they could take back. And if they had paused to think about it first, they probably would have acted differently.

Pausing doesn't pay off just when you speak. Scientific studies have shown that making a habit of pausing before you do something can actually have a big impact on how your life turns out.

THINKING IT THROUGH: THE TEEN BRAIN CHALLENGE

In making decisions we rely on two areas of the brain: 1) the *limbic system*, which creates and processes emotions, and 2) the *prefrontal cortex*, which governs logical thought. The type of decision, how we feel about it, and how prepared we are to handle it helps determine which brain area has the most influence.

But our age also plays an important role. Thinking through the consequences of one's actions is actually harder for teens because the prefrontal cortex is not fully developed until around age 25. This is why teens often feel an intense emotional drive to act impulsively—it's how their brains are structured!

Though this tendency to act without considering the outcomes can lead to problematic situations, impulsivity during the

PAUSING PAYS OFF

Throughout our lives, there are opportunities where our level of self-control can directly and immediately influence important outcomes.

Birth

CHILDHOOD

TEEN YEARS

SELF-CONTROL

LACK OF SELF-CONTROL





developmental years evolved because it makes teens more open to new experiences and ideas. This openness helps teens become independent adults.

TRAIN YOUR BRAIN

The key to making impulsivity work for you—instead of against you—is to train your brain by practicing pausing. This doesn't mean you stop taking risks or being open to new experiences. But you won't know if the risk is worth it until you think it through. Deciding to take a risk based on logic shows self-control, not impulsivity.

What are different ways to pause? You might take a deep breath, count to 10, or ask, "Is this worth it?" Different strategies work for different people. Whatever works for you, keep doing it!

By practicing pausing, you can actually change your brain. This means that over time, pausing, instead of immediately reacting, becomes your "natural" response. And with this change, people are on their way to enjoying the life rewards that come with high levels of self-control—even if they weren't natural-born pausers!

ADULTHOOD



YOU KEEP COOL UNDER PRESSURE. YOU'RE PROMOTED!



YOU CAN'T CONTROL YOUR TEMPER. YOU'RE FIRED!

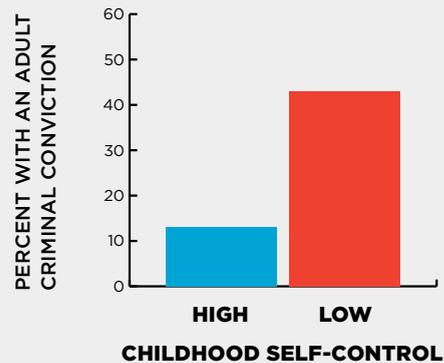
High Self-Control = Bankroll

Pausing, paying attention, and not giving up are all key parts of self-control. Long-term scientific studies have linked a person's self-control when they were younger to how successful they became as adults. One study followed the behavior of nearly 1,000 children born in the same year in Dunedin, New Zealand, for 32 years!

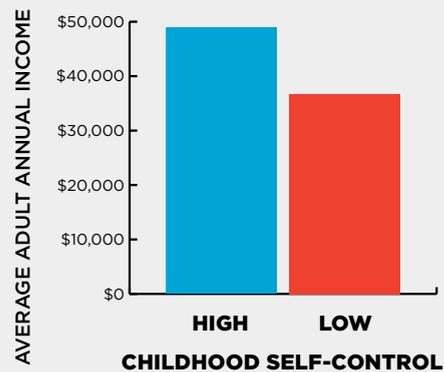
Through this research, scientists have shown that individuals with high self-control have better grades, stronger relationships, and greater income levels. Those with low self-control over time are more likely to be in trouble with the law, as well as have health problems, including drug addiction.



CRIME: Impact of Self-Control on Adult Criminal Behavior



WEALTH: Impact of Self-Control on Adult Income



SOURCE: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA. SAMPLE SIZE = 972.

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Student Edition

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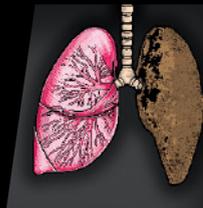


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